1-1-1983

Ophiolite and melange terrane, Caucomgomoc Lake Area, Northwestern Maine

Steven G. Pollock

TRIP C-5

OPHIOLITE AND MELANGE TERRAIN CAUCOMGOMOC LAKE AREA, NORTHWESTERN MAINE

Stephen G. Pollock
Department of Geosciences
University of Southern Maine
Gorham, Maine 04038

INTRODUCTION

Outcrops of Pre-Silurian rocks in the Caucomgomoc Lake area of northwest central Maine are interpreted as a stratigraphic succession of ophiolite overlain by metasiltstone melange. The rocks are greenschist metamorphic grade and have an estimated minimum cumulative stratigraphic thickness of 4000 m. The Pre-Silurian section of the Caucomgomoc Lake area occurs as an isolated structural fenster in fault contact with upper Silurian (Pridoli) to lower Devonian (Gedinnian?) sedimentary and volcanic rocks on the east, south and north. Locally to the south and north, the Pre-Silurian section is in fault contact with the Seboomook Formation (lower Devonian - Seigenian). The faults are not extensively exposed. However, where they are exposed, they show pronounced cataclasis and mineralization to include quartz, limonite, and calcite. Most of the major faults appear as high angle easterly dipping normal faults, with the hanging wall down dropped to the east. Over all, the Pre-Silurian dips and youngs to the west. On the western outcrop margin the melange is unconformably overlain by the Frontenac Formation.

The area had not been mapped in detail prior to this study. There were geologic reconnaissance excursions in the 19th century by Jackson (1838) and Hitchcock (1861, 1901) and in the 20th century by Raabe (1973). Over the last decade, the ophiolite has been investigated by private industry and consultants for economic mineral deposits. Geologic maps of this area include Hitchcock (1901), Keith (1933), Doyle (1967) and Raabe (1973). These show the area to consist variably of sandstones, slates and greenstones (metabasalts). Pollock (1983, in preparation) is the latest contributor to the geology of this area.

STRATIGRAPHY[1]

The Pre-Silurian section is composed of three formations which generally thin to the north. The lower most unit, (COl

[1]The Geologic Names Committee of the U. S. Geological Survey has approved the use of following formation names: Loon Stream Formation, Caucomgomoc Lake Formation and Hurd Mountain Formation. These are being used informally here with the committee's permission. Formal descriptions are in preparation.

on figure 1) has not been subdivided into members of lentils. The middle formation (COc on figure 1) has three members in the vicinity of Caucomgomoc Lake. These members undergo a facies change to the north and south and/or are tectonically terminated against basalts of this formation to the south and north, and metasiltstone of the uppermost formation to the north. While the upper unit (COh on figure 1) is interpreted as a melange. Three separate lithogically distinctive members are recognized in this formation.

FORMATIONS

Unit 1. (Loon Stream Formation)

The lowermost formation is a very fine to fine grained pale green (10G 6/2), grayish green (5G 6/1) and pale yellowish green (10GY 7/2) metapelite. Locally red colorations may be seen. The metapelite is characteristically slate and phyllite. Less than 1% detrial grains or silt size grains are seen in thin section. Subsidiary lithologies within this formation include medium to coarse grained aphyric metabasalt, phyric metafelsite with phenocrysts of biotite and quartz and poorly sorted metawacke.

Sedimentary structures are poorly defined or preserved in the metapelite. Where bedding is clearly seen it is 2 to 20 cm thick and is delineated by ubiquitous thin white to buff weathering laminae. The laminae are interpreted to have originally been silts and/or volcanic ash. The laminae are generally structureless, but rarely exhibit textural grading. Other sedimentary structures have not been observed.

This unit does not crop out extensively. Outcrops most commonly do not exhibit sedimentary or tectonic structures other than a pervasive slaty cleavage or schistoscity which trends northeast and dips variably to the northwest. Because of a lack of sedimentary structures, it is difficult to estimate preserved stratigraphic thickness. Thickness estimates range between 1000 and 3000 meters.

The contact zone between this and the overlying unit varies locally. The contact is either conformable and gradational or unconformable. In both instances wacke beds increase in abundance and thickness upward toward the contact with the overlying unit. On the south shore of Caucomgomoc Lake there occurs a zone where wacke beds and metapelite are disrupted and are not physically traceable for distances of more than a few meters. This disrupted zone is clearly evident along the shoreline south of an unnamed island 400 meters off shore. On the north shore of Caucomgomoc Lake the transition between the two units appears gradational and conformable. An interpretation given to account for this variation is that deposition of the lower unit occurred on a slope, or that the sediments were semi or unconsolidated. Volcanism

responsible for the rocks of the overlying unit caused the slope or sediment to become unstable, initiating slumping or other mass movement. The result was local production of a disrupted zone between the lower and overlying units. Another interpretation assumes that the whole Pre-Silurian package is a tectonic melange, into which is incorporated very large sections or rafts of ophiolite. Within this package are tectonic zones or imbricate thrusts which are local and are not internally persistent for large distances.

Unit 2. (Caucomgomoc Lake Formation)

This unit consists of a succession of interbedded volcanic and clastic sedimentary material which is 1500 to 2400 meters thick. Generally the unit is thicker in the southern part of the outcrop area. In the vicinity of Caucomgomoc Lake the unit is subdivided into three members. North and south of the lake rapid complex facies changes and poor outcrop make subdivision of the unit impractical. Where mapped, the lower and upper members are volcanic in origin and the middle member is sedimentary. The rocks young westward with dips ranging between 37° and 90° to the west. Small synclines and anticlines are present on the north shore of Caucomgomoc Lake. The section to the south of Caucomgomoc Lake is essentially a monocline with strikes between N 10° W and N 35° E. Dips average 57° to the west.

The volcanic rocks are basaltic in nature. Usually SiO_2 content ranges between 44 and 51 wt%. Alkali content ($K_2O + Na_2O$) exceeds 3.5% in most samples. TiO_2 commonly exceeds 1.5%. The rocks have been metamorphosed to greenschist facies. For the most part the original minerals have been recrystallized and textures include ghosts or relics of pre-existing minerals. The mineralogy of the volcanics is chlorite, epidote, zoisite, calcite, ± amphibole, ± biotite, ± plagioclase (albite or oligoclase), ± quartz, ± Fe-Ti oxides and sulfides. Relic pyroxenes are only very rarely present and olivine has yet to be observed. These rocks would best be referred to as spilites following the usage of Williams, Turner and Gilbert (1982). Details on the petrology is in preparation.

Lower Member

Thickness of this member ranges between a maximum of 1100 meters south of Caucomgomoc Lake to 196 meters and less north of the lake. The member is comprised of metabasalts. Specifically these metabasalts are agglomerates, breccias, lapilli tuffs, tuffs and flows. Metapelite, chert, and wacke (quartz and felspathic) are rare lithologies interbedded with the agglomerates, lapilli tuffs and flows. This member differs from the upper member in that it is principally comprised of a larger volume of agglomerates and lapilli tuffs relative to flows. The upper member is comprised of a larger volume of flows relative to agglomerates and lapilli tuffs. The agglomerates are composed of bombs ranging in size from 6.4 to 35 cm. The bombs are commonly aphyric

EXPLANATION

LOWER DEVONIAN

Dsu — SEBOOMOOK FORMATION UNDIFFERENTIATED

ORDOVICIAN(?) TO DEVONIAN(?)

ODf — FRONTENAC FORMATION

UPPER SILURIAN AND LOWER DEVONIAN

ALLAGASH LAKE FORMATION

DSav - predominantly pillowed baslat with interbedded conglomerate, limestone and sandstones of various classification

DSas - mixed sedimentary rocks including limestone, wackes, arenites, siltstones and shales (with and without hematite cement) and conglomerates.

CAMBRIAN(?) AND ORDOVICIAN(?)

UNIT 3 (Hurd Mountain Formation)

€Ohb - pillow basalts, basaltic agglomerate and basaltic lapilli tuffs

€Ohm - meta-siltstone, claystone slate and phyllite minor calcareous meta-siltstone. Commonly

€Ohs exhibits rusty weathering. Unit is complexly deformed and pervasively sheared. Unit is interpreted as a tectonic melange. Other rock types in the pelitic host include quartz wacke, meta-basalt, ultra-mafics, gabbros, diorites and granodiorites.

€Ohs - medium to thick bedded quartzose wacke, usually texturally uniform and lacking sedimentary structures.

UNIT 2 (Caucomgomoc Lake Formation)

€Ocb - a dominantly phyric and aphyric meta-basalt flows undifferentiated.

$€Ocb_2$ - upper member on Caucomgomoc Lake. Phyric and aphyric pillowed and non-pillowed basalt flows, basaltic agglomerate and basaltic lapilli tuff.

€Ocs - medium to thick bedded quartzose wacke and siltstone.

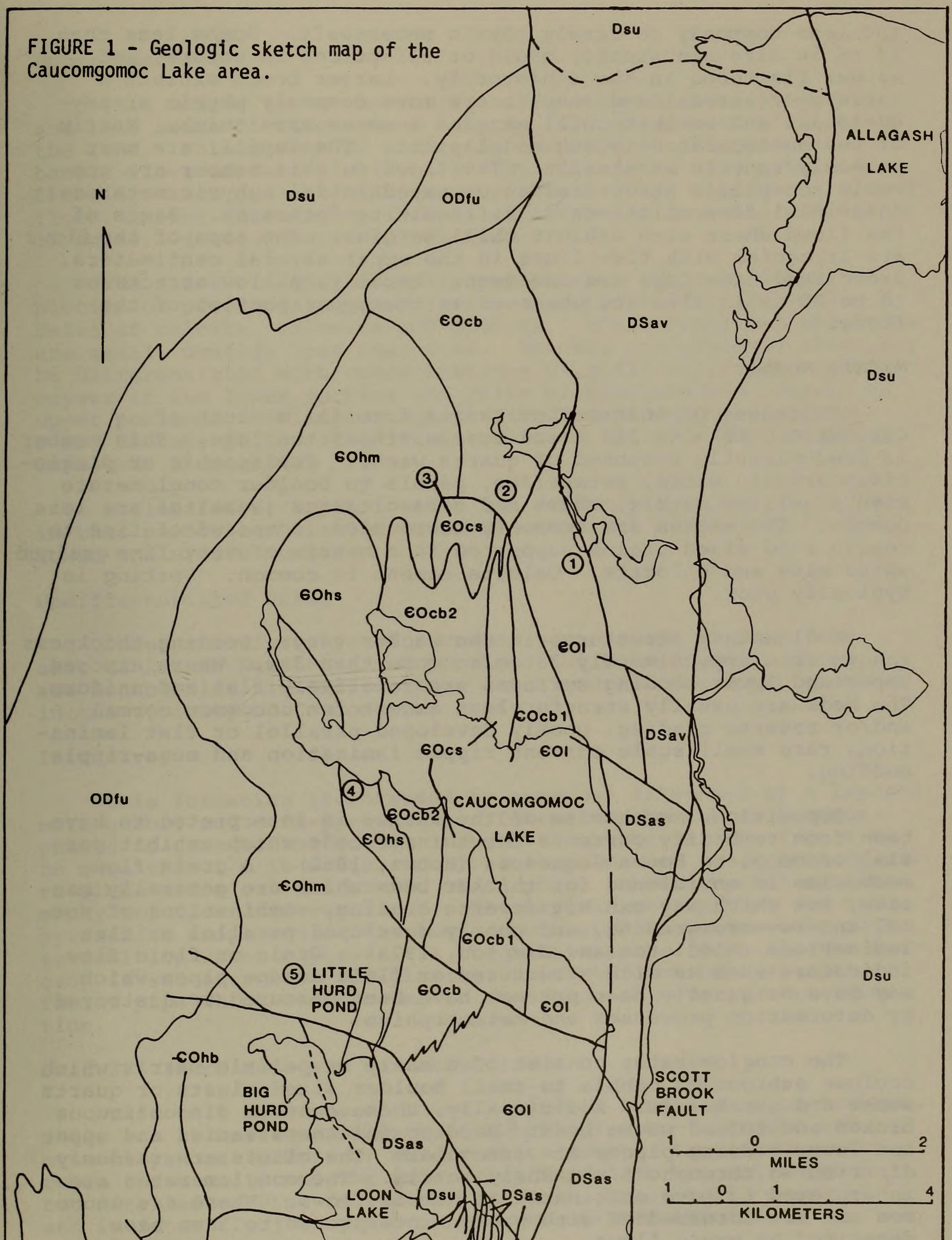
$€Ocb_1$ - lower member on Caucomgomoc Lake. Basaltic lapilli tuffs, basaltic agglomerates, basaltic flows common.

This unit is locally intruded by gabbroic and ultra-mafic stocks and dikes.

UNIT 1 (Loon Stream Formation)

€Ol - greenish meta-pelite including siltstone, slate and phyllite. Thin to thick bedded ubiquitous laminae and grayish red color common locally.

FIGURE 1 - Geologic sketch map of the Caucomgomoc Lake area.



and less commonly to rarely phyric metabasalt. Bombs less than 12 cm in size are usually ovoid or elliptical in nature, and appear flattened in the schistocity. Larger bombs exhibit a variety of streamlined shapes, are more commonly phyric or amygdaloidal and exhibit chill margins 1 cm or more thick. Matrix of the agglomerates is ash and lapilli. The lapilli are most commonly aphyric metabasalt. The flows in this member are commonly non-pillow structureless or amygdaloidal aphyric metabasalt. Individual flow thickness is difficult to determine. Bases of the flows where seen exhibit chill margins. The tops of the flows are irregular with flow lines in the upper several centimeters. Brecciated flow tops are uncommon. Locally, pillow structures 10 to 25 cm in size are observed in the upper portion of the flows.

Middle Member

Thickness of this member ranges from 511 m south of Caucomgomoc Lake to 215 m and less north of the lake. This member is predominantly composed of quartz wacke. Feldspathic or plagioclase arkosic wacke, metapelite, pebble to boulder conglomerate with a pelitic matrix, chert and metavolcanics (basalts) are less common. The wackes are commonly subrounded, composed of fine to coarse sand sized grains supported in a matrix of very fine grained white mica and chlorite. Calcite cement is common. Sorting is typically poor.

Sedimentary structures in the wackes vary. Bedding thickness ranges from approximately 30 cm to more than 3 m. Where exposed upper and lower bedding surfaces are relatively flat and uniform. The beds are usually structureless except for uncommon normal and/or reverse grading, poorly developed parallel or flat lamination, rare small scale current ripple lamination and mega-ripple bedding.

Depositional mechanism of the wackes is interpreted to have been from turbidity currents for thinner beds which exhibit partial or complete Bouma Sequences (Bouma, 1962). A grain flow mechanism is envisioned for thicker beds which are generally massive, but which may exhibit reverse grading, combinations of normal and reverse grading, and poorly developed parallel or flat laminations (Middleton and Hampton, 1973). Grain or fluid flow indicators such as dish structures or fluid escape pipes which may have originally been present have been obscured or destroyed by deformation processes and metamorphism.

The conglomerates consist of a shaly or pelitic matrix which enclose subrounded pebble to small boulder sized clasts or quartz wacke and metabasalt. Additionally, these contain discontinuous broken and folded wacke beds. Bedding thickness varies and upper and lower bedding planes are irregular. The clasts are randomly distributed throughout the shaly matrix. The conglomerates are interpreted to have originated as debris flows. These are uncommon and are interbedded with wackes interpreted to have been deposited as grain flows.

Upper Member

This member varies in thickness from approximately 760 m and less south of Caucomgomoc Lake to 1000 m and more north of the lake. This member is primarily composed of pillowed metabasalt flows of variable (3 to 15+ m) thickness. Non-pillowed flows are also present and are generally thicker than the pillowed flows. Minor lithologies include basaltic agglomerates and lapilli tuffs, wackes, chert and pelite.

The flows are most commonly phyric with relic amphibole biotite or plagioclase phenocrysts, or amygdaloidal with amygdules of calcite, chlorite and epidote. Phenocrysts and amygdules are small, usually less than 4 mm. Thicker non-pillowed flows may be differentiated with concentrations of small relic mafic phenocrysts in the lower portion and relic plagioclase phenocrysts in upper portions. Pillows range in size from 6 cm to as much as 2 m. Average pillow size is less than 45 cm, with chill margins less than 3 cm thick.

Agglomerates, lapilli tuffs and sedimentary rocks which occur in this member are similar to those described previously in the lower and middle members.

Undifferentiated Units

Three undifferentiated sections occur south of Loon Lake, east of Little Hurd Pond and northwest of Poland Pond. These are metabasalts similar to those described for the upper member in the vicinity of Caucomgomoc Lake.

Intrusives

This formation is intruded by numerous dikes and by a layered meta-gabbro and meta-pyroxenite. Intrusives have been metamorphosed to greenschist facies. The dikes range in size from 6 cm to more than 1 m in width. Compositionally they range from felsic to ultra-mafic and are phyric or aphyric. Phyric varieties commonly are flow differentiated. The layered meta-gabbro and meta-pyroxenite crops out on the south shore of Caucomgomoc Lake with several low water exposures in the lake itself. Over all the outcrop is sub-circular. Originally, this may have been a major feeder pipe which contributed to the volcanic pile of this formation.

Unit 3. (Hurd Mountain Formation)

This unit consists of three principle lithologies or members. These are 1) meta-quartz wackes (COhs); 2) meta-siltstone and meta-claystone (COhm); 3) metabasalts (COhb). The contacts between these units and the underlying formation are not exposed but detailed mapping indicates this unit structurally overlies and is laterally juxtaposed to the preceding formation.

The quartz wacke (COhs) may be conformable on top of metabasalt. There is reasonable consistency of strikes and dips across the contact area to support this supposition.
The quartz wackes are medium to thick bedded, texturally uniform and generally lack current generated sedimentary structures. This unit is thicker in the northern outcrop area than in the southern. It is not known if the thinning is due to an original sedimentary facies change or a later tectonically induced thinning. The latter is the preferred interpretation.

The second lithology or member is dominantly a laminated or thinly bedded meta-siltstone, claystone slate or phyllite. This lithology commonly may be characterized by rusty weathering.

Locally the meta-siltstone and claystone slate or phyllite is a pebble conglomerate. Pebble sized clasts of pelite or aphanitic igneous rocks and medium to coarse sand size grains of quartz and plagioclase feldspar are completely supported in matrix. Pebble sized clasts are commonly elongated and attenuated in the schistoscity. The pebble sized grains are not ovoid or elliptical but rather elongated angular grains with ragged or serrated ends. Minor lithologies within the meta-siltstone include calcareous siltstone, quartz wacke, metabasalt and ultramafics, primarily pyroxenite. Intruded (?) into this unit are small granodiorite and gabbro stocks and small discontinuous porphyritic aphanite sills.

The meta-siltstone lithology is interpreted as a tectonic melange. The thin bedded meta-siltstone is the host lithology. The other lithologies mentioned are tectonically included remnants of previously more extensive units or intrusions(?). The meta-siltstone is pervasively sheared. Thin discontinuous siltstone lamina or beds are tightly folded into kink bands or chevron folds. Thick wacke beds are also discontinuous, exhibit a variety of fold styles and are commonly broken by small scale faults. The metabasalts and ultramafics are of limited outcrop extent, ranging from a few square meters to several hundred square meters in area. The preferred interpretation is that the wackes (COhs) and the metabasalts (COcb) and wackes (COcs) were partially dissected during the subduction or obduction process.

The third lithology of this unit is a large relatively thick section of metabasalts, very similar in nature to the basalts on Caucomgomoc Lake. The section is predominatly pillowed and non-pillowed metabasalts. Minor lithologies include agglomerates and lapilli tuffs. The lower contact of this section is exposed on the shore of Big Hurd Pond. Structural relationships indicate that this overlies meta-siltstone. A conglomerate at the base of the section has pebble sized clasts attenuated and elongated into cleavage These basalts were incorporated into the melange during subduction. The northern and southern contacts are fault contacts either with the meta-siltstone melange or with the Seboomook formation.

STRATIGRAPHIC CORRELATION OF OPHIOLITE AND MELANGE MAINE AND QUEBEC

	QUEBEC	WESTERN MAINE	CAUCOMGOMOC LAKE	MUNSUNGUN
	Laurent, 1978	Boone, Boudette and Moench, 1981 Boudette, 1982 Boudette and Boone, 1976	Pollock (this paper)	Anticlinorium Hall, 1969, 1970
LOWER ORDOVICIAN	St. Daniel Formation			
CAMBRIAN	Upper Ophiolite Complexes	Hurricane Mountain Formation	Unit 3 Hurd Mountain Formation	Unnamed Green Phyllite Chase Brook
		Jim Pond Formation	Unit 2 Caucomgomoc Lake Formation	
			Unit 1 Loon Stream Formation	
	Lower Ophiolite Complexes	Boil Mountain Formation		

Age and Correlation

The age of the units described here has not been established. Detailed mapping to date has not led to the recovery of macro fossils. Selected lithologies have been appropriately treated and examined for micro fossils without positive results. The entire section is currently thought to range in age from middle to late Cambrian through lower Ordovician(?). The inferences to the age are based on correlation with similar lithologies and stratigraphic sequences to the southwest and northeast of the Caucomgomoc Lake area within Maine and to the west in Quebec.

Figure 2 shows current stratigraphic correlations of the Caucomgomoc Lake ophiolite and melange with other sections in Maine and Quebec.

The section described in this paper is stratigraphically homotaxial with the Jim Pond and Hurricane Mountain Formations, (Boone, Boudette and Monech, 1981; Boudette, 1982; and Boudette and Boone, 1976) of western Maine. This section was presumed to be of late Cambrian to early Ordovician age in these articles. However, G. Boone (verbal communication, 1982) assigns a Cambrian age to the Hurricane Mountain Formation. Correlatives to the northeast include the Chase Brook Formation and an unnamed green phyllite. (Hall, 1970) and Group A unit 1 and 2, (Hall, 1969). Hall, (1969, 1970) assigns a middle and upper Cambrian age to these units. Laurent (1978) assigns an upper Cambrian to lower Ordovician age for ophiolites of the Thetford Mines area and lower Ordovician for the melange of the St. Daniel Formation in Quebec.

REFERENCES

Boone, G.M., Boudette, E.L., Monech, R.H. (1981), Geologic Outline Map of Pre-Silurian Units north central Maine to northern New Hampshire: (Cabs). Geol. Soc. Amer. Abstracts with Programs v. 13 no. 3 p. 123.

Bouma, A.H. (1962), Sedimentology of Some Flysch Deposits Amsterdam Elsevier Publ. Co. 168 p.

Boudette, E.L. (1982), Ophiolite Assemblage of Early Paleozoic Age in Central Western Maine in Major Structural Zones and Faults of the Northern Appalachians; P. St. Julien and J. Beland (eds.). Geol. Assoc. of Canada Spec. Paper 24 p. 209-230.

Boudette, E.L. and Boone, G.M. (1976), Pre-Silurian Stratigraphic succession in central western Maine in Contributions to the Stratigraphy of New England; L.R. Page (ed.), Geol Soc. Amer. Memoir 148 p. 79-96.

Doyle, R.G. (1967), Preliminary Geologic Map of Maine: Me. Geol. Survey.

Hall, B.A. (1969), Pre-Taconic Unconformity in northern New England and Quebec: in Amer. Assoc. Petroleum Geol. Memoir 12, p. 467-476.

Hall, B.A. (1970), Stratigraphy of the Southern End of the Munsungun Anticlinorium. Maine Geol. Survey Bull. 22, 63 p.

Hitchcock, C.H. (1861), Preliminary Report Upon the Natural History and Geology of the State of Maine: Maine Board of Agriculture 6th Ann. Rept. p. 91-458.

Hitchcock, C.H. (1901), Geological Map of Maine in Steward, J.H. and Co., State Atlas of Maine, 1901, p. 14-17, 27.

Jackson, C.T. (1838), Second Annial Report on the Geology of the Public Lands Belonging to the Two States of Maine and Massachusetts, Augusta, 276 p.

Keith, A. (1933), Preliminary Geologic Map of Maine: Maine Geol. Survey.

Laurent, R. (1978), Ophiolites from the Northern Appalachians and Quebec in North American Ophiolites. R.B. Coleman, W. P. Irwin (eds.). State of Oregon Dept. of Geology and Mineral Industries Bull. 95, p. 25-40.

Middleton, G.U. and Hampon, M.A. (1973), Mechanics of Flow and Deposition in Turbidites and Deep Water Sedimentation, G.U. Middleton and A.H. Bouma co-chairmen. Soc. Econ. Paleont. and Mineral. Pacific Section Short Course, Anaheim, Calif. p. 1-38.

Pollock, S.G. (1983), Bedrock Geology of the Caucomgomoc Lake and Southern one-half of the Allagash Lake Quadrangles. Open file Report, Maine Geological Survey.

Raabe, J. (1973), Allagash and Caucomgomoc Lake area. Open file Report, Maine Geological Survey 14 p.

Williams, H., Turner, F.J., Gilbert, C.M., (1982), Petrography 2nd ed., W.H. Freeman and Co., 626 p.

ITINERARY

TRIP		
0.0	0.0	8:00 a.m. leave from Pray's store and travel west on the Golden Road.
		Note: This trip involves travel on remote privately maintained woods roads where access is controlled. Your vehicle should be equipped with good tires, a good spare and a reliable

jack. You should also have a full tank of gas at the start.

This trip would not have been possible without the permission and courtesy of North Maine Woods, Ashland, Maine; Seven Islands Land Company, Bangor, Maine; and Great Northern Paper Company, Millinocket, Maine.

The itinerary lists several optional stops. One or more of these may be visited in lieu of those planned. Those outcrops visited will depend on weather, lake level and road conditions on the day of the trip.

7.8	7.8	Road leading to Greenville is on the left.
17.0	9.2	Outcrops of Seboomook Formation will be seen now for the next several miles (no stopping).
24.5	7.5	West Branch Penobscot River
26.2	1.7	Ragmuff Gate. This gate is locked and maintained by Great Northern Paper Company. For the rest of the trip we will be on roads to which there is no general access by the public. Speeds on these roads will be between 25 and 45 mph. Do not deviate from the route described or lag behind. The terrain for the next several miles is relatively flat. Outcrop is sparse. This is typical of terrain underlain by the Seboomook Formation.
32.8	6.6	Former site of Great Northern's Ragmuff logging camp.
40.6	7.8	Bear to left at Forestry sign.
40.9	0.3	Junction of Four Roads. Bear to right on the road which is maintained. (Not a sharp right onto the road with the grassy center leaving the gravel road on your left.)
41.2	0.3	Town line marker
44.3	3.1	Locked gate. We are now leaving Great Northern lands. Lands that we are now driving on are managed by Seven Islands Land Co. Continuing down this road, ridges which appear before us are the outcrop area of the Allagash Lake Formation.

46.3	2.0	Caucomgomoc Lake Dam. From the dam you have a panoramic view of Caucomgomoc Lake. Low hills to the north (right, as you face Caucomgomoc Lake), are the outcrop area of Allagash Lake Formation. The hills in the distance to the west (looking down the lake), is the outcrop area of the Frontenac. The lower hills, also to the west and closer to the lake, are Pre-Silurian outcrop. The trace of the Scott Brook fault trends approximately north-south between the dam and the Allagash Lake Formation. Scott Brook, Loon Stream and Ciss Stream all follow this fault. The Scott Brook fault separates the Allagash Lake Formation from the Seboomook Formation. Cross the dam and proceed.
47.9	1.6	LEFT TURN
50.9	3.0	Ciss Stream Bridge, cross and proceed.
51.5	0.6	BEAR LEFT and take the left arm of the "Y" at the intersection. Outcrops of the Allagash Lake Formation on either side of the road as you proceed.
53.2	1.7	Poland Pond. Brief stop.
53.3	0.1	STOP 1. Loon Stream Formation. This outcrop is typical of the greenish metapelite of this unit. Pervasive slaty cleavage strikes N 22° E with dips 47° to the northwest. Locally in this outcrop you may see kink bands, northwest trending fracture cleavage and two sets of steeply dipping quartz veins.
53.5	0.2	OPTIONAL STOP 1. Loon Stream Formation. This outcrop is less slaty in overall appearance. Metabasalt is present on the south side of the road. One may speculate that portions of this unit were originally a mafic or basaltic ash.
54.0	0.5	Loon Stream Formation (no stopping)
54.1	0.1	OPTIONAL STOP 2. Left turn. Proceed approximately 2.1 miles to the shore of Caucomgomoc Lake. At low water, a traverse of the shore line will exhibit in relative close proximity all of the major lithologies of the Caucomgomoc Lake Formation. Additionally, you may see many of the volcanic and sedimentary features of this unit.

54.2	0.1	STOP 2. Caucomgomoc Lake Formation. A large outcrop of metabasalt. This outcrop demonstrates textural variability of this unit on a small scale. Some units may be interpreted as volcanic ash while others may be interpreted as flows. Please be careful not to fall or dislodge rocks onto your colleagues below.
55.3	1.1	STOP 3. Caucomgomoc Lake Formation. Quartzose and feldspathic wackes. Lithologies and sedimentary features are fairly typical of the sandstones which are interbedded with the basalts of this unit.
57.9	2.6	LEFT TURN
62.4	4.5	Caucomgomoc Chain. This gate is operated by North Maine Woods.
63.2	0.8	STOP 4. Hurd Mountain Formation. Wackes and pelites of the undeformed lower portion of this formation.
63.5	0.3	OPTIONAL STOP 3. Left turn. Proceed down the road (but do not turn in to the camp yard on the left), as far as rationally possible, (approximately 0.5-0.75 mi). Park the vehicles and proceed to the lake shore. From there traverse east along the shoreline noting the basalts and sedimentary rocks of the Caucomgomoc Lake Formation.
63.8	0.3	Gate
64.2	0.4	RIGHT TURN
64.6	0.4	STOP and park on the side near the "Y" in the road. Here we will probably combine the party into the vehicles with highest clearance. We will proceed on the "right arm"of the "Y" (bear right). We will stop at several exposures of the Hurd Mountain Formation. This area exhibits the best outcrop and shows the variation in lithology and "tectonic style" of the melange.

There have been several "wash outs" on the roads in this area. Drivers are urged to use caution and not tailgate.

Return to vehicles and retrace route to Loon Lake road.

65.0	0.4	RIGHT TURN onto Loon Lake Road. Small outcrops of the Hurd Mountain Caucomgomoc Lake, and Loon Stream Formations are exposed as "pavement" along this road. No stopping.
68.7	3.7	OPTIONAL STOP 4 - LEFT TURN. This Woods road is passable with two wheel drive vehicles. Fallen trees may make passage difficult or impossible. You should be able to drive down this road for approximately two miles before it becomes impassable. Loon Stream Formation outcrops in the road as pavement sporadically. These outcrops provide you with typical lithology of the unit as well as structures commonly seen. From where the road becomes impassable, make your way to the shore of Caucomgomoc Lake and traverse northwesterly observing outcrops of Loon Stream Formation as you proceed.
72.6	3.9	LEFT TURN onto Scott Brook Road.
73.9	1.3	BEAR RIGHT at four road intersection. We will now retrace our route to Pray's store.
88.6	14.7	Ragmuff Gate. LEFT TURN.
107.0	18.4	RIGHT TURN for those of you who are going to GREENVILLE. Greenville is 35 miles. First gas station is in Kokadjo about 15-18 miles down this road. STRAIGHT for those of you who are going to Millinocket.
114.8	7.8	Pray's store.